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MR. ROOSEVELT'S BOOK ON AFRICAN GAME ANIMALS*

By CHARLES C. ADAMS

Those who are acquainted with Roosevelt's former writings on game animals and who also know of Heller's zoölogical writings will naturally expect valuable results from the present product of joint authorship. The authors claim that the main value of their work is that it treats of the subject ''primarily as a suggestion of what is still open for discovery in this vast field of animal psychology and adjustment to environment.'' In other words, they hope to stimulate the study of the response of animals to their environments. Such studies would advance not only geography but also animal ecology.

The investigations upon which this treatise is based are mainly upon Roosevelt's eleven months' Smithsonian expedition, to which Heller added further field studies and extensive taxonomic studies in European and American museums. Such opportunities have never been equaled by previous authors.

The general chapters occupy about a fourth of the volume and cover the history of British East Africa, the origin of the fauna, both geographically and paleontologically, concealing and revealing coloration and their relation to natural selection, game preserves, equipment for hunting and collecting expeditions, and a bibliography of the game of East Equatorial Africa. The remainder of the two volumes, about 600 pages, is devoted to the detailed accounts of each kind of animal. Prevailing opinion derives the present African fauna from southern Europe and Asia, but this is because the European Miocene beds are well known, while those of Africa are little known. It is surprising that in a work of this character no reference is made to Lull's ''The Evolution of the Elephant'' (*Amer. Jour. Sci.*, Vol. 25, 1908, pp. 1-44, and the *Smithsonian Rept.* for 1908, pp. 641-675); or to Engell's work on the range and abundance of the elephant and lion in Africa (*Petermanns Mitteilungen, Ergänzungsheft, No. 171,* 1911).

The big-game fauna of British East Africa and Uganda is composed of three faunal areas. The chief source of this fauna has been the ''South African region, to which three-fourths of the species are closely allied.'' The second element is allied to Somaliland or northeast Africa, while a small number of forest kinds have been derived from the Congo forests. The large carnivores and the elephants are generally distributed so that the faunal regions mapped have been based solely upon the hoofed mammals. In this discussion of the origin of the present fauna no effort is made to utilize the idea that formerly the climate of East Africa was more humid, a condition which would favor the Congo forest types and which may explain the presence of isolated colonies of such animals at favorable points within the arid region. (See *Bulletin,* Vol. 46, 1914, p. 133.)

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* Life-Histories of African Game Animals. By Theodore Roosevelt and Edmund Heller. Vol. 1: 420 pp. Vol. 2: pp. 421-798. Ils., index. C. Scribner's Sons, New York, 1914. $10. 10x7.

Within the faunal areas are life zones "based upon climatic and floral factors and quite independent of other barriers.... By using the zonal names in connection with the plant associations, we are enabled to define very precisely the habitats of the various animals inhabiting the region. The zones are primarily upon a floral basis, being founded upon the ranges of various trees and shrubs to which the distribution of a majority of the animals conform." Five of these zones are recognized and mapped. A bamboo grows at from 9,000 to 10,000 feet in an almost pure stand and is almost uninhabited by animals. It is refreshing to see the influence of vegetation so clearly recognized when it has been so often neglected by field naturalists. This relation is most clearly shown in a chapter devoted to the influence of the flora upon the fauna, in which they state that "plant associations are really the most important floral factors in the distribution of animals and are the most precise means of defining their range." Cocoa-palm characterizes the low tropical coast; the desert nyika extends far inland as a xerophytic thorn-bush steppe, between 500 and 3,000 feet altitude. Hère the acacia, giant euphorbias, doum-palm and baobab are characteristic trees and the wait-a-bit bush (acacia) thrives. The high prairie veldt, between 3,200 and 9,000 feet, is grassland. The lower part of this zone contains acacia parks, grass with scattered brush and trees, while the upper part is dominated by grasses. The highland forest occupies the high plateau between 6,000 and 10,000 feet. By means of the fringe of forests along the streams, West African Congo forest animals have crossed the continental divide to the East Coast drainage.

These forests are composed of a great variety of trees, of rather limited range. The lower, middle and upper parts are very different. Strangely, the lower edge near the grasslands does not grade through a park-like stage into the forest but is massed and dense at its margin. At the timberline there is no dwarfing of the trees; the forest simply thins out and is bordered by a nearly pure stand of bamboo forest. Above the tree limit lie the Alpine moors, up to an elevation of from 10,000 to the snow at 14,500 feet. To follow this discussion of the vegetation a topographic map is needed, and a better map also than the one accompanying this work. Furthermore, it is confusing to use names in the text which are not given on or do not agree with the map. A fuller discussion of the climate and physical features of the region would have been of signal value. The discussion of the vegetation in general is static and not after the common standpoint of American ecological students, or that of Moore (The Tanganyika Problem, pp. 107-119. 1903).

The discussion of Thayer's views on coloration is judicious and temperate. The authors say of Thayer's book: "His elaboration of the importance of counter-shading in concealing objects under certain circumstances is very valuable indeed as a contribution to coloristic law. But his application of it as being the prime and well-nigh all-important factor in concealing coloration, produced through the 'omnipotence' of natural selection, is wholly untenable." As to concealing coloration, the general conclusion is drawn: "The first and most important point to remember is that, as regards the immense majority of birds and mammals, the prime factors in securing their safety are habit, if they do not trust to concealment, and habit and cover if they do trust to concealment." This chapter contains many valuable observations upon the behavior of animals in nature.

The chapter on game preserves is a brief account which concludes with the following significant remark: ''We sympathize with and admire the big-game hunter, but the time has passed when he can be taken very seriously if he is nothing but a big-game hunter. He ought to be in addition an out-of-doors naturalist, a faunal naturalist, or, at least, a trustworthy and interested observer and recorder of what he sees while in the wilderness'' (pp. 159-160).

Practically three-fourths of the work is devoted to detailed accounts of the natural history of the different game species, beginning with the lion and closing with the elephant. The general method of treatment is indicated by the following topics: General account of a group or kind of animal, a rather full account of its behavior during chase, daily life and habits, variation in behavior at different times and in different conditions, and excellent illustrations and numerous distributional maps, which add much to the value of the book. The haunts are described fully, and very valuable accounts are given of the temperaments and emotions of animals, a phase which is frequently neglected by students of animal behavior because of their greater interest in the intelligence of animals. Supplementing the description of the animals are the keys for the determination of genera, species and races, and throughout this part the hand of a master taxonomist is in evidence.

On several occasions the authors emphasize the need of further study of the drinking habits, or rather lack of such habits, on the part of the animals in arid regions. Certainly there is a fine problem for a field naturalist. It is a problem, however, from which he will not secure the best returns unless he posts himself somewhat upon the physiology of water metabolism, such, for example, as he may find by Babcock (Metabolic Water: Its Production and Rôle in Vital Phenomena, *Univ. of Wis. Research Bull. No. 22,* 1912).

In brief, the work is a very valuable contribution both to geography and zoölogy, and no other book covers the same field. On account of their exceptional facilities and experience, the authors have given us a work which will long be standard in its field.